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10/574,671	07/15/2008	John Mak	100325.0284US	1746

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FISH & ASSOCIATES, PC
ROBERT D. FISH
2603 Main Street
Suite 1000
Irvine, CA 92614-6232

EXAMINER	
BALDRIDGE, LUKAS M	

ART UNIT	PAPER NUMBER
3784	

NOTIFICATION DATE	DELIVERY MODE
10/07/2011	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

rfish@fishiplaw.com
patents@fishiplaw.com

Office Action Summary	Application No.	Applicant(s)	
	10/574,671	MAK, JOHN	
	Examiner	Art Unit	
	LUKAS BALDRIDGE	3784	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 April 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-20* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *03 April 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *06/28/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 1 and 19 are objected to because of the following informalities: In claim 1, line 7 the words "operate a" should be changed to - -operate at a- -; In claim 19, line 1 the word "another" should be changed to - -one- - because claim 19 does not recite a previous portion to thereby define "another portion." Appropriate correction is required.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 and 9 recite the limitation "wherein the flow ratio is a function of desired ethane recovery" in lines 11-12. It is unclear which of the previously recited flow ratios the limitation is referring to, thereby rendering the claim indefinite. It is believed the limitation is referring to the ratio "(b)" since it appears immediately after ratio (b) and has been examined as such.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1-12, 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sorenson (U.S. Pat. No. 5,685,170) in view of Yao et al. (U.S. Pat. No. 6,116,050, hereinafter "Yao").

In regard to claims 1 and 9, FIG. 1 of Sorenson discloses an absorber (14) configured to receive an absorber feed stream (12) and a first reflux stream (50), and further configured to provide a bottom product stream (20);

a distillation column (24) configured to receive a first portion (26) of the bottom product stream and a second portion (28) of the bottom product stream at different

points, and wherein the distillation column is further configured to operate at a pressure that is lower than an operating pressure in the absorber (col. 4, lns. 41-42; col. 5, lns. 57-58); and

controlling the flow ratio of (b) the first portion of bottom product stream to the second portion of the bottom product stream (col. 2, lns. 66-67; col. 4, lns. 14-16), wherein the flow ratio is a function of desired ethane recovery in the distillation column bottom product stream (*inherent; since the purpose of the entire system is to recover desired constituents of the hydrocarbon gas feed, which includes an amount of ethane in the column bottoms, any operation, for example varying the flow in lines 26 and 28, is viewed as a function product recovery*).

Sorenson does not explicitly disclose (i) a second reflux stream and (ii) a control unit to control the ratio of (a) the feed stream to the second reflux stream and (iii) the ratio of (b). However, Yao discloses a hydrocarbon separation system.

(i) FIG. 2 of Yao teaches a second reflux stream (29; *in addition to a first reflux stream 45 from column 73*). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to provide a second reflux stream, as taught by Yao, in the Sorenson invention, in order to advantageously provide reflux to the absorber to improve constituent separation and system efficiency.

(ii) FIG. 2 of Yao teaches a control unit (28a) to control the ratio of the feed stream (25) to the second reflux stream (29) (*controls flow to line 29, which alters the content of stream 25 to 30*). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to control the ratio of the feed stream to the

second reflux stream, as taught by Yao, in Sorenson as modified, in order to advantageously cool and condense a calculated portion of feed to provide reflux to the absorber and improve constituent separation and system efficiency.

(iii) FIG. 2 of Yao teaches the technique of a control unit (28a) to control the ratio of flow between two streams (26, 30). The technique is applicable to the Sorenson invention, is part of the ordinary capabilities of one skilled in the art, and one of ordinary skill in the art would have recognized that applying the known technique of a control unit to the first and second portions of the bottom products stream would have yielded predictable results, i.e. controlling flow proportions through the respective lines.

In regard to claim 2, and as applied to claim 1, Sorenson, as modified, discloses a heat exchanger (18) configured to heat the first portion of the bottom product stream, and further comprising an expansion device (56) configured to cool the second portion of the bottom product stream (col. 4, lns. 14-16).

In regard to claim 3, and as applied to claim 1, Sorenson, as modified, discloses wherein the distillation column is configured to produce a distillation column overhead (52), and wherein the plant further comprises a compressor (58) that compresses the distillation column overhead to at least absorber pressure (col. 4, lns. 41-42 and 65-67; *622 psi is greater than absorber's 574 psi*). (*Also, pump 46 increases the pressure of overhead to 587 psi*).

In regard to claim 4, and as applied to claims 1 and 3, Sorenson, as modified, discloses a cooling device (48) thermally coupled to the distillation column overhead and configured to cool the compressed distillation column overhead.

In regard to claim 5, and as applied to claims 1, 3 and 4, Sorenson, as modified, discloses wherein the cooled compressed distillation column overhead is the first reflux (*52, 38, 50*).

In regard to claim 6, and as applied to claim 1, Sorenson, as modified, discloses wherein the absorber is configured to produce an absorber overhead product (22) that has a temperature of equal or lower than -90 ºF and a pressure of between 500 psi and 700 psi (col. 4, lns. 41-42).

In regard to claim 7, and as applied to claims 1 and 6, Sorenson, as modified, discloses a compressor (42) that is configured to receive the absorber overhead product and to compress the absorber overhead. Sorenson does not explicitly disclose compressing to a pressure of at least 800 psi. However, Yao discloses a hydrocarbon separation system. Yao teaches compressing absorber overhead to a pressure of at least 800 psi (col. 8, lns. 58-61). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to compress the absorber overhead to at least 800 psi, as taught by Yao, in Sorenson as modified, in order to advantageously

provide a high pressure product in the pipeline to increase flow rate within a delivery pipeline.

In regard to claim 8, and as applied to claims 1, 6 and 7, Sorenson, as modified, discloses wherein the compressor is operationally coupled to an expander (30). Sorenson, as modified, does not explicitly disclose wherein the expander expands the absorber feed stream. However, FIG. 2 of Yao teaches an expander (31) operationally connected to a compressor that expands the absorber feed stream (30). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to provide an expander to expand the absorber feed stream, as taught by Yao, in Sorenson as modified, in order to advantageously provide the absorber with a cooled feed stream to produce valuable product streams by separating constituents of the feed gas.

In regard to claim 10, and as applied to claim 9, Sorenson, as modified, discloses feeding a distillation column overhead product (52) to the absorber (*52, 38, 50*).

In regard to claim 11, and as applied to claims 9 and 10, Sorenson, as modified, discloses wherein the overhead product is compressed (42 or 46), cooled (48) and fed to the absorber as a the first reflux stream (50).

In regard to claim 12, and as applied to claim 9, Sorenson, as modified, discloses wherein the distillation column is operated at a pressure between 300 and 500 psig (col. 5, lns. 57-58) and wherein the absorber is operated at a pressure of between 500 and 800 psig (col. 4, lns. 41).

In regard to claim 15, and as applied to claim 9, Sorenson, as modified, discloses wherein the absorber produces a cryogenic absorber overhead stream (22), and further comprising compressing (42, 58) the overhead stream to a pressure suitable for liquefaction (*inherent; subjecting the stream to a low enough temperature will liquefy the stream, regardless of pressure*).

In regard to claim 16, and as applied to claims 9 and 15, Sorenson, as modified, does not explicitly disclose wherein the compressing (*of 42*) is driven by the expansion of the absorber feed stream (*at least a portion of the absorber feed stream is eventually expanded in expander 30*).

4. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sorenson (U.S. Pat. No. 5,685,170) and Yao et al. (U.S. Pat. No. 6,116,050, hereinafter "Yao") and further in view of Wilkinson et al. (U.S. Pub. No. 2003/0005722).

In regard to claim 13, and as applied to claim 9, Sorenson, as modified, discloses separating a cooled feed gas (12) into a liquid portion and a vapor portion (col. 2, ln. 55). Sorenson, as modified, does not explicitly disclose feeding the liquid portion after at least partial depressurization and warming into the distillation column. However, Wilkinson discloses a hydrocarbon separation system. Wilkinson teaches separating a cooled feed gas (31a) and feeding a liquid portion (33) after at least partial depressurization (*in 12*) and warming (*in 10*) into a distillation column (19). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to feed the liquid portion after depressurization and warming into the distillation column, as taught by Wilkinson, in Sorenson as modified, in order to advantageously separate methane from the feed gas to provide a product stream for consumption as plant fuel and to provide consumers with natural gas.

In regard to claim 14, and as applied to claims 9 and 13, Sorenson, as modified, does not explicitly disclose wherein the vapor portion is split into a first and second stream to thereby form the second reflux stream and the absorber feed stream. However, Yao teaches splitting a vapor portion (25) into a first and second stream to thereby form a second reflux stream (26) and an absorber feed stream (30). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to split the vapor stream and form a second reflux stream and absorber feed stream, as taught by Yao, in Sorenson as modified, in order to advantageously connect the feed to the absorber and increase separation efficiency by introducing a reflux into the column.

5. Claims 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yao et al. (U.S. Pat. No. 6,116,050, hereinafter "Yao") in view of Wilkinson et al. (U.S. Pub. No. 2003/0005722) and Sorenson (U.S. Pat. No. 5,685,170).

In regard to claim 17, FIG. 2 of Yao discloses a heated (*in 23*) liquid portion (15) of a feed gas (10) and feeding a vapor portion (25) of the feed gas to an absorber (14);

adjusting a flow ratio (*with 28a*) of an absorber feed (30) to a second reflux (29) to the absorber (*adjusting flow in 29 inherently adjusts flow through 30*), and using a first reflux (45) that is provided by a distillation column overhead product (77) to thereby control an absorber overhead temperature (*the reflux inherently controls the temperature because its temperature affects the temperature in the column*);

adjusting a temperature (*in 23*) of an absorber bottom product (55) that is fed to the distillation column (56, 70) to thereby control a distillation column overhead temperature (*the stream inherently controls the temperature within the column because its temperature affects the temperature in the column*).

Yao does not explicitly disclose (i) feeding an expanded and heated liquid portion of feed gas to the distillation column and (ii) operating the absorber at a higher pressure than the distillation column.

(i) Wilkinson, however, discloses a hydrocarbon separation system. FIG. 4 of Wilkinson teaches that it is well known in the art to provide an expanded and heated

liquid portion (33b) of feed gas to a distillation column (19) (*of an absorber/distillation column system*). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to provide an expanded and heated liquid portion of feed gas to a distillation column, as taught by Wilkinson, in the Yao invention, in order to advantageously separate methane from the feed gas to provide a product stream for consumption as plant fuel and to provide consumers with natural gas.

(ii) Sorenson discloses a hydrocarbon separation system. Sorenson teaches the well known technique of operating the absorber (14) at a higher pressure than the distillation column (24) (col. 4, lns. 41-42; col. 5, lns. 57-58). The technique taught by Sorenson is applicable to Yao, as modified, is part of the ordinary capabilities of one skilled in the art, and one of ordinary skill in the art would have recognized that applying the known technique would have yielded predictable results, i.e. separation of constituents of a hydrocarbon stream in a column.

In regard to claim 18, and as applied to claim 17, Yao, as modified, discloses wherein the step of adjusting the absorber bottom product temperature is performed by heating at least one portion of the absorber bottom product in a heat exchanger (Yao, *stream 22 is heated in heat exchanger 23*; Wilkinson, *stream 33a is heated in heat exchanger 10*).

In regard to claim 19, and as applied to claim 17, Yao, as modified, discloses wherein the step of adjusting the absorber bottom product temperature is performed by

cooling at least one portion of the absorber bottom product using a JT valve (Wilkinson, *expansion valve 12*).

In regard to claim 20, and as applied to claim 17, Yao, as modified, discloses wherein the step of adjusting the flow ratio of the absorber feed to the second reflux to the absorber is a function of desired C2 recovery (*inherent; since the purpose of the entire system is to recover desired constituents of the hydrocarbon gas feed, which includes an amount of ethane in the column bottoms, any operation, for example varying the flow in lines 29 and 30, is viewed as a function product recovery*).

Conclusion

The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Lupfer (U.S. Pat. No. 3,224,947) and Yao et al. (U.S. Pat. No. 5,992,175) disclose adjusting stream ratios to obtain desired products.

Patel (U.S. Pub. No. 2004/0148964), Mak et al. (U.S. Pub. No. 2004/0261452), Mak (U.S. Pub. No. 2004/0206112), Campbell et al. (U.S. Pat. No. 6,526,777) and Mak (U.S. Pub. No. 2010/0206003) disclose hydrocarbon separation systems.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LUKAS BALDRIDGE whose telephone number is 571-270-3782. The examiner can normally be reached on M-F 9 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor Frantz Jules can be reached at 571-272-6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LUKAS BALDRIDGE/
Examiner, Art Unit 3784

/Frantz F. Jules/
Supervisory Patent Examiner, Art Unit 3784